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(54) Title: METHOD AND INSTALLATION FOR COATING WIRE MATERIAL

(57) Abstract: Method and installation for coating wire material wherein the wire material passes through a coating unit (4) in which powder lacquer is applied to the wire material, and subsequently through a curing unit (5) in which the powder lacquer is cured. The wire material is continuously fed through the coating unit (4) and the curing unit (5).

Method and installation for coating wire material

Introduction

The present invention relates to a method and installation for coating wire material, in particular for coating wire mesh.

State of the Art

Wire material is generally surface coated in order to protect its surface. Its aesthetic appeal can also be enhanced by the applied coating e.g. through colour.

Usually polyvinyl chloride (PVC) coatings are used for coating wire material. Like in other synthetic resins, solvents are one of the most important raw materials used in PVC coatings. The wire material is drawn through a bath of fluidised PVC; the PVC adheres to the wire material and is then usually drawn through a gas driven oven so as to cure the PVC. The solvent in PVC is chloride. These chlorides can be set free during, and all too often also after, the curing of the PVC. It is nowadays an established fact that chlorides are ecologically harmful and are therefore undesired. Prolonged exposure to vinyl chloride, a gas principally used in the making of PVC, has for instance been linked to several forms of cancer in humans and laboratory animals.

There is hence a strong need to replace PVC coatings with a more environment-friendly coating.

Object of the invention

It is the object of the present invention to provide a method and installation for applying protective coating to wire material, which is less ecologically harmful. This object is achieved through a method as claimed in claim 1 and through an installation as claimed in claim 17.

General description of the invention

In order to overcome the above-mentioned problem, the present invention provides a method for coating wire material wherein the wire material passes through a coating unit in which powder lacquer is applied to the wire material, and subsequently through a curing unit in which the powder lacquer is cured. The wire material is continuously fed through the coating unit and the curing unit. A driving means preferably continuously feeds the wire material through the coating unit and the curing unit. The coating unit preferably comprises a multitude of nozzles through which powder lacquer is uniformly sprayed onto the wire material. The coating unit can also comprise an aspiration hood for collecting the powder lacquer sprayed through the nozzles but not deposited on the wire material. This collected powder lacquer can then e.g. be recycled and used again. The powder lacquer can e.g. be a polyester powder, which does not contain solvents. Such a powder lacquer is hence more environment-friendly than solvent-based synthetic resin coatings. In order to increase adherence of the powder lacquer to the wire material, the powder lacquer can be electrostatically charged and/or comprise additives. Due to such additives, even galvanised wire material, on which adherence of any kind of coating substance is generally very poor, can easily be coated by the present method. A further advantage of powder lacquers over solvent-based synthetic resins is the great choice of colours that is available. Also, the changing from one powder lacquer to another, e.g. in order to use a different colour, can occur rather rapidly. Air can e.g. simply be blown through the nozzle system so as to clean the nozzles and their supply conduits. Once the system is cleared of the first powder lacquer, the second powder lacquer is connected to the supply conduits of the nozzles.

The wire material to be coated can comprise at least one single wire, a wire mesh or any combination thereof. The method hence allows the simultaneous coating of a wire mesh, e.g. a garden fence, and its tensioning wires. Such a wire mesh comprises a multitude of wires in a first direction and a multitude of cross-wires in a second direction, which is not parallel to the first direction. The

cross-wires can be perpendicular to the wires, in which case a square or rectangular wire mesh is obtained. If the cross-wires are not perpendicular to the wires, a diamond shape wire mesh can be obtained.

The wires and cross-wires of the wire mesh can be knotted together so as to form a knotted wire mesh. Preferably however, the wires and cross-wires of the wire mesh are welded together so a to form a welded wire mesh.

The curing of the powder lacquer can take place through conventional heating in a curing unit, which e.g. comprises a preferably gas-driven oven. The temperature, up to which the coated wire material is heated, preferably lies above 150°C, so that curing of the powder lacquer can take place. At the same time, the temperature does preferably not exceed 200°C, so that if the production comes to a standstill, the wire material is not immediately damaged if it remains in the curing unit for longer. For a travelling speed of the wire material of about 25 meters per minute, such a curing unit would for example be about 25 meters in length.

The curing of the powder lacquer can also take place through UV-radiation and/or IR-radiation in a curing unit. Such a curing unit e.g. comprises an UV-radiation unit and/or an IR-radiation unit. The powder lacquer cures more quickly under UV/IR-radiation than under conventional heat, which means that the length of the curing unit can be reduced. For a travelling speed of the wire material of about 25 meters per minute, such a curing unit would for example be about 6 meters in length.

The curing of the powder lacquer most advantageously takes place through NIR-radiation (Near-Infra-Red radiation) in a curing unit, which e.g. comprises an NIR-radiation unit. The wavelength of NIR-radiation lies in the range between 0.76 and 1.2μm. The powder lacquer cures more quickly under NIR-radiation than under UV/IR-radiation, which means that the length of the curing unit can be even further reduced. For a travelling speed of the wire material of about 25 meters per minute, such a curing unit would for example be about 2 meters in length.

Before applying the powder lacquer to the wire material, the wire material can undergo a surface treatment in a pretreatment unit. The surface treatment preferably at least comprises a roughening of the surface of the wire material. By roughening the surface of the wire material, the powder lacquer has better adherence to the wire material.

The wire material can be preheated in a preheating unit before applying the powder lacquer to the wire material. Adherence of the powder lacquer to the wire material is thereby further increased.

The welding points of the welded wire mesh are preferably cleaned in a cleaning unit before the powder lacquer is applied to the wire material. Welding points are always liable to have some imperfections. By cleaning the welding points before the powder lacquer is applied, these imperfections can be removed and a more even finish of the wire material can be obtained.

Before the powder lacquer is cured, the wire material can pass through at least one additional coating unit in which additional powder lacquer is applied to the wire material. The powder lacquer and the additional powder lacquer are preferably of different composition and/or colour.

The very first step of the method can be an unwinding of the wire material from a coil in an unwinding unit.

The coated wire material can be wound onto a coil in a winding unit.

Before the wire material is wound onto a coil in the winding unit, the wire material can be cooled down in a cooling unit.

The present invention also provides an installation for implementing the method for coating wire material comprising a coating unit for applying powder lacquer to the wire material, a curing unit for curing the powder lacquer, and driving means for continuously passing the wire material through the coating and curing units.

The curing unit can either comprise a gas-driven oven, an UV-radiation unit and/or an IR-radiation unit, an NIR-radiation unit, or any combination thereof.

Upstream of the coating unit, the installation can further comprise an unwinding unit for unwinding the wire material from a coil; a pretreatment unit for surface treating the wire material; a cleaning unit for cleaning the wire material and welding points; and/or a preheating unit for preheating the wire material

Downstream of the coating unit, the installation can further comprise a cooling unit for cooling down the wire material; and/or a winding unit for winding the wire material onto a coil.

It will be appreciated that, if need be, supplementary units can be inserted in the installation. Such supplementary units could e.g. be additional coating units, cleaning units for cleaning the coated wire material, or deformation units for deforming the wire material.

Detailed description with respect to the figures

The present invention will be more apparent from the following description of some not limiting embodiments with reference to the attached drawings, wherein

Fig.1: shows a schematic layout of a first embodiment of an installation for coating wire material according to the invention;

Fig.2: shows a schematic layout of a second embodiment of an installation for coating wire material according to the invention; and

Fig.3: shows a schematic layout of a third embodiment of an installation for coating wire material according to the invention.

A schematic layout of a first embodiment of an installation for coating wire material according to the invention is shown in Fig.1. An unwinding unit 1 is used for unwinding wire material from a coil. The unwound wire material is tensioned and continuously fed through a pretreatment unit 2 in which the surface of the wire material is roughened in order to facilitate adhesion of powder lacquer to the surface of the wire material. In order to further facilitate adhesion of powder lacquer to the surface of the wire material, the roughened wire material is fed from the pretreatment unit 2 through a preheating unit 3. In the preheating unit 3, the wire material is preheated, whereby adhesion of

powder lacquer to the surface of the wire material is further facilitated. The wire material then continues into a coating unit 4 comprising nozzles by means of which powder lacquer is sprayed onto the wire material. The nozzles are arranged in such a way that powder lacquer can be sprayed uniformly onto the wire material, i.e. in such a way that the same amount of powder lacquer is applied all over the wire material. The powder lacquer is a polyester powder not containing any solvents and which can therefore be applied in an environment-friendly way. The coated wire material then passes through a curing unit 5 in which the powder lacquer is cured. The curing unit 5 of this first embodiment comprises a gas-driven oven. A cooling unit 6 cools the wire material down before the coated wire material is wound onto a coil by a winding unit 7.

Existing wire coating installations can relatively easily be adapted so as to be able to implement the method of the present invention. The pretreatment unit 2 is not present in existing installations; it can however easily be fitted. The coating unit of the existing installation, i.e. a bath-type coating unit, can be replaced with a spray-type coating unit. In order to be able to feed the wire material through the installation at a travelling speed of about 25 meters per minute, the curing unit needs to be about 25 meters long, so that the temperature on the oven does not have to be risen considerably. The total length of such an installation will then be about 85 meters.

A schematic layout of a second embodiment of an installation for coating wire material according to the invention is shown in Fig.2. This embodiment comprises essentially the same units as the first embodiment described here above. In the curing unit 5 of this embodiment, the coated wire material is cured through IR or UV radiation. The curing unit of existing installations can be modified so as to comprise IR and/or UV irradiators, which allow much faster curing of the powder lacquer to take place. Due to the faster curing of the powder lacquer, the length of the curing unit can be shorter. In order to be able to feed the wire material through the installation at a travelling speed of about 25 meters per minute, the curing unit can now be about 6 meters long. The total length of such an installation will then be about 70 meters.

A schematic layout of a third embodiment of an installation for coating wire material according to the invention is shown in Fig.3. In the curing unit 5 of this embodiment, the coated wire material is cured through NIR radiation. The curing unit therefore comprises a NIR-radiation unit with NIR irradiators. The NIR irradiators allow very fast curing of the powder lacquer to take place. The length of the curing unit can be reduced to about 2 meters while maintaining a travelling speed of the wire material through the installation of about 25 meters per minute. Furthermore, if NIR irradiators are used there is no need to include a preheating unit or cooling unit, thereby further reducing the total length of the installation. The total length of such an installation could e.g. be reduced to about 30 meters.

If need be, supplementary units can be inserted in the installation. Such supplementary units could e.g. be additional coating units for applying an additional powder lacquer of e.g. different colour, cleaning units for cleaning the coated wire material, or deformation units for deforming the wire material. A cleaning unit for cleaning the wire material upstream of the coating unit 4 would e.g. be particularly useful for cleaning welding points of the wire material if the latter is e.g. a welded wire mesh.

It will be appreciated that single wires can be fed through the installation simultaneously with the wire mesh.

Claims

1. Method for coating wire material wherein said wire material passes through a coating unit (4) in which powder lacquer is applied to said wire material, and subsequently through a curing unit (5) in which said powder lacquer is cured; wherein said wire material is continuously fed through said coating unit (4) and said curing unit (5).
2. Method according to claim 1, wherein said powder lacquer is sprayed onto said wire material.
3. Method according to claim 1 or 2, wherein said wire material comprises at least one single wire.
4. Method according to any of claims 1 to 3, wherein said wire material comprises a wire mesh.
5. Method according to claim 4, wherein said wire mesh is a knotted wire mesh.
6. Method according to claim 4, wherein said wire mesh is a welded wire mesh.
7. Method according to any of claims 1 to 6 wherein said powder lacquer is a polyester powder.
8. Method according to any of claims 1 to 7 wherein said curing of said powder lacquer takes place through conventional heating.
9. Method according to any of claims 1 to 8 wherein said curing of said powder lacquer takes place through UV-radiation.
10. Method according to any of claims 1 to 9 wherein said curing of said powder lacquer takes place through IR-radiation.
11. Method according to claim 10 wherein said curing of said powder lacquer takes place through NIR-radiation.

12. Method according to any of claims 1 to 11 wherein, before applying said powder lacquer to said wire material, said wire material undergoes a surface treatment.

13. Method according to claim 12 wherein said surface treatment comprises roughening of the surface of the wire material.

14. Method according to any of claims 1 to 13 wherein, before applying said powder lacquer to said wire material, said wire material is preheated.

15. Method according to any of claims 6 to 14 wherein, before applying said powder lacquer to said welded wire mesh, the welding points of said welded wire mesh are cleaned.

16. Method according to any of claims 1 to 15, wherein, before curing said powder lacquer, said wire material passes
through at least one additional coating unit in which additional powder lacquer is applied to said wire material.

17. Installation for coating wire material, comprising
a coating unit (4) for applying powder lacquer to said wire material;
a curing unit (5) for curing said powder lacquer; and
driving means for continuously passing said wire material through said coating unit (4) and said curing unit (5).

18. Installation according to claim 17, wherein said wire material comprises at least one single wire.

19. Installation according to claim 17 or 18, wherein said wire material comprises a wire mesh.

20. Installation according to claim 19, wherein said wire mesh is a knotted wire mesh.

21. Installation according to claim 19, wherein said wire mesh is a welded wire mesh.

22. Installation according to any of claims 17 to 21 wherein said curing unit (5) comprises an oven.

23. Installation according to any of claims 17 to 22 wherein said curing unit (5) comprises an UV-radiation unit.

24. Installation according to any of claims 17 to 23 wherein said curing unit (5) comprises an IR-radiation unit.

25. Installation according to claim 24 wherein said curing unit (5) comprises an NIR-radiation unit.

26. Installation according to any of claims 17 to 25, wherein said driving means comprises

an unwinding unit (1) upstream of said coating unit (4) for unwinding said wire material from a coil; and

a winding unit (7) downstream of said curing unit (5) for winding said wire material onto a coil.

27. Installation according to any of claims 17 to 26, further comprising

a pretreatment unit (2) upstream of said coating unit (4) for surface treating said wire material

28. Installation according to any of claims 17 to 27, further comprising

a preheating unit (3) upstream of said coating unit (4) for preheating said wire material

29. Installation according to any of claims 17 to 28, further comprising

a cooling unit (6) downstream of said curing unit (5) for cooling down said wire material

30. Installation according to any of claims 21 to 29 wherein said installation further comprises a cleaning unit upstream of said coating unit (4) for cleaning welding points of said welded wire mesh.

31. Installation according any of claims 17 to 30, wherein said installation comprises at least one additional coating unit.

32. Wire material coated with powder lacquer according to any of claims 1 to 16.

33. Welded wire mesh coated with powder lacquer according to any of claims 6 to 16.

Fig.1

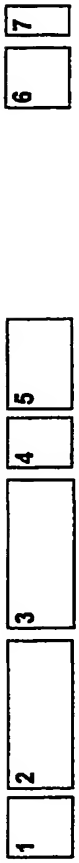

Fig.2

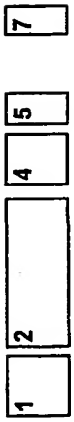

Fig.3

INTERNATIONAL SEARCH REPORT

al Application No
PCT/EP 01/09063

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 B05D7/20 B05[redacted]

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 B05D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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Y	figure 1 column 2, line 3 - line 12 column 3, line 10 - line 47 column 5, line 30 - line 37	9,11

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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

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Date of the actual completion of the international search	Date of mailing of the international search report
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Name and mailing address of the ISA	Authorized officer
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Form PCT/ISA/210 (second sheet) (July 1992)

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